***Which elements of digital competence should be acquired at school?***

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**1. Introduction**

Before answering the question, we elaborated it from curriculum’ point of view, and we increased for the consideration a sub-question: Should digital competence be taught as a subject of its own or integrated into other subjects? These both questions are based on decisions about the curriculum, both in a broad and general sense and for each subject.

Similarly as in answering to other questions, we had to consider what issues to include in the definition of “digital competences”. Studies about curriculum do not necessarily directly use the term “digital competence” but discuss, for example, “digital literacy”, “information seeking skills” or “ICT skills” because there is not yet any established way to use the concept (see also the answer about defining the concept of digital competence. In this paper, we list those elements that are mentioned in the research papers. Further, in the answer below, original author’s definition of the element is mentioned when reviewing the results if relevant, to make it clear what kind of element of digital competence has been investigated in the referred articles.

As expected, there is no clear and direct answer to this question, and there are no articles directly discussing this topic. Instead of answering which elements to teach they were answering what kind of skills can be acquired. In addition, the research articles were mainly theoretically oriented and based on existing empirical research instead of giving empirical evidence in the article itself. We found several articles concerning learning *new literacies* or *information / digital literacy* which had media education as wider background and which connected the topic to such subjects as languages or visual arts but less article about other subject or the curriculum in general.

**2. Digital competence thought in school**

***What contents should be taught in school?***

Erstad (2010) broadens digital literacy to media literacy and he suggests the following aspects of media literacies as part of school-based learning: 1) Basic skills, 2) Media as an object of analysis, 3) Knowledge building in subject-domains, 4) learning strategies, and 5) Digital Bildung/ Cultural competence.

Erstad defined aspects and categories of media literacy by which he tried to operationalise media literacy in school practices, and which are not connected to any specific subjects or technologies. *Add his table* Besides this, Erstad emphasized user-generated content creation (Web2.0, editing software) in which students have an active role in knowledge practices.

E: specific tests to measure students’ media literacy (see the answer about assessment?)

***Practical examples of curriculum changes***

An action research based case study about literacy workshop which was replaced with multiliteracies curriculum which emphasized ‘multimodal design’ (Walsh, 2007). The aim was to incorporate and extend the use of digital technologies from students’ out-of-school repertoires of practice. Walsh reported changes 1) in his own understanding: he (the teacher) became better acquainted with the concept of multimodality and include texts from youth digital culture into his own teaching. 2) A shift of focus from literacy instruction in which students imitated literacy practices the teacher had modeled to students becoming inventors / designers of new genres. Walsh emphasized the authentic settings which resemble some of the changing work contexts and which make the literacy practices relevant to students’ life worlds.

***Changes needed for the curriculum***

In several articles an essential conclusion was the need for changes, in the curriculum, in structures, in teachers’ competence, etc. The necessary changes:

In the school subjects:

- in general (Erstad, 2010; Hague & Williamson, 2009) *katso jälkimmäinen vielä uudelleen.* Knowledge building in subject-domains (Erstad, 2010): new technologes change fundamental issues within school subjects: calculateor in mathematics…Knowledge is interconnected with the cultural tools we have and that changes over time.

- literature, writing (Luce-Kapler; Walsh; O’Brien)

In the structures of school (O’Brien)

In the assessment (O’Brien)

***Skills and digital literacy***

In her research-based paper Labbo (2006) says that new literacies are best to learn when computer technologies are integrated throughout the day and across the curriculum, and she gives examples: email has encouraged student exchanges around the world, email exchanges create authentic and motivating reasons to communicate. Students must learn conventions of this unique genre; Internet activities invite students’ inquiry projects and interdisciplinary work in which they may gain literacy skills, employing all of the language and multimedia arts, while investigating and sharing relevant content. She regarded the most important considerations driving the need for transformed, computer-related pedagogy the fact that reading from screen is so different from reading on the page. This improves the visual literacies, which include the ability to interpret, recognize, critically evaluate, and utilize visual graphics.

***ICT / digital literacy in curriculum: a separate subject or integrated in several subject?***

An interesting change has happened during the last ten years: while the question “Should ICT be a separate subject or integrated in other subjects” was a burning question about 15-10 years ago, in none of the papers this issue was discussed – so self-evident was that the digital technology should be integrated to all subjects and to all learning and teaching processes. In addition, in several papers was discussed the level of digital competence today: the high level of digital skills / competence among the young is so obvious and acquired in informal settings that there seemed to be no role for school to teach technology skills separately. (The high level digital competence is not simply true but problematic and often over-generalized, as found in several studies, and discussed, e.g., by Erstad, 2010 and Buckingham, 2007.)

In his book, Buckingham (2007) summarized this by saying that we need a broader reconceptualization of what we mean by literacy in a world that is increasingly dominated by electronic media and we should not just simply add media or digital literacy in to curriculum menu or hive off the information and communication technology into a separate subject, and dominated by the practice of decontextualized skills that most students find merely redundant. Children and teenagers acquire forms digital media literacy outside school simply by using these media. The role for school is to offer such experiences, perspectives and knowledge that they might not encounter in the informal settings.

*Used in Q3 but better here:*

Concerning school curriculum and the discussion about whether the skills of using technology should be taught as a separate subject domain, the dominant opinion in the articles was that the best way to support students’ digital competence is to use technology in various school subjects and for various purposes. Allen (2007) stated that there should be a school-wide consensus on goals, methods, and responsibilities about the acquisition of information literacy skills. Based on a survey targeted to teachers in Czech Republic, Benes, Mudrak, Prochazka, Rambousek & Stipek (2008) reported that teachers favour the approach that information education is not limited to the subject information technology itself but the development of information technology competences is supported by the wide usage of ICT in other subjects not directly focused on informatics, and also in various educational information activities that are not directly linked to these subjects. The improvement of digital competencies or related skills can be an important additional goals or side-effects in settings where technology is used in education for other purposes, mainly learning of some subject domain content. Mitchell and Dunbar (2006) investigated the role of computers within the nursery sector as the potential way of introducing young children to computers. Their results indicate that the programs that were in use appeared to provide the children with a range of enjoyable and purposeful learning tasks that enabled the promotion of emergent ICT skills.

*Remember to write about: How to break down the concept of digital literacy to areas that school can use in teaching? What are the subjects at school that should support the development of digital competences?*

**3. Method for answering the question**

***Elaborating the question***

The question ”Which elements of digital competence should be acquired at school?” was formulated based on several authentic questions, which focused on questions related to the curriculum and digital skills (such as “ Which ICT skills should be acquired at school?“ and “Is the current curriculum suitable for developing digital competence, and to what extent?”) or even a quite detailed one: “What role should social media have in school”?

***Search procedures***

The searches were conducted using EBSCOhost, which is an on-line retrieval system of scientific articles related to educational, psychological and behavioral sciences. The searches were targeted to two databases in the system: Academic Search Complete and Education Research Complete. The results from these databases were narrowed down by the following restrictions: Articles were to be peer reviewed, in English, published in between 2005-2010 (originally in between 2000-2010, but due to vast amounts of irrelevant hits this was further restricted) and finally the full text was to be available through EBSCOhost with the rights purchased by the University of Helsinki.

The search words used in the process were mainly derived from the vocabulary of the questions and their synonyms. In addition to these, some terms were added using the professional knowledge of the researchers involved in the process.

The process was started with a more general search shared with all the questions related to Digital Competence. This was conducted to roughly estimate the workload and adjust parameters for the search. The search words used in the general search were:

* digital competence\* (all text)
* digital skill\* (all text)
* digital literac\* (all text) AND education (subject terms) AND school (subject terms)
* ICT skill\* (all text) AND education (subject terms) AND school (subject terms)
* ICT competenc\* (all text) AND education (subject terms) AND school (subject terms)
* ICT literac\* (all text) AND education (subject terms) AND school (subject terms)

In addition the following searches were conducted especially for this theme:

* digital literac\* (all text) and curriculum (subject terms)
* ICT literac\* (all text) and curriculum (subject terms)
* ICT skill\* (all text) and curriculum (subject terms)
* ICT competenc\* (all text) and curriculum (subject terms)

(The term indicated between the parentheses describes which parts of the database the search words were directed to.)

In addition to the searches into the databases, a manual search of theme related scientific journals, covering one year of publications, was conducted in the University of Helsinki Minerva-library at the campus of cognitive sciences. More articles were also found through the reference listings of articles that came up in the searches. Some of the reference articles were also familiar to the researchers from previous experiences with the field of study.

All in all XX research papers and 1 book were used in composing the answer.

**4. References**

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